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Non-Binding Knee Pad

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## ABSTRACT

Knee pads that may be quickly donned over work clothing offer protection to knees and clothing and long-term comfort when kneeling without binding behind the knees.

## TECHNICAL FIELD

This invention relates in general to knee pads, and more specifically, to knee pads that protect knees and clothing without restricting blood circulation in the leg ("binding") and while maintaining cooling air flow, for comfort and ease of use.

## BACKGROUND OF THE INVENTION

Construction workers, landscapers, roofers, carpet layers, plumbers and electricians, farmers and gardeners often spend hours on their knees over the course of their workday. The surfaces on which they kneel may be hard, gritty and abrasive, and/or wet and muddy. Knees become sore, clothing becomes dirty and wears quickly, pants become wet and remain uncomfortable for the duration of the day.

Typical denim jeans or overalls provide little protection against the wear and discomfort of these surfaces. As a result, a number of products meant to provide a cushioning, protective layer between the knee and the work surface have been introduced over the years.

Early knee pads were permanently or removeably attached to coveralls or pants. Herbelin (U.S. Utility Patent No. 588,907) describes coveralls or pants with built-in, detachable knee protectors. White (U.S. Utility Patent No. 727,243) describes pants with a pocket in the knee area with a removeable pad. Walker (U.S. Utility Patent No. 2,355,193) and Denman (U.S. Utility Patent No. 4,831,666) describe similar concepts. Carlson (U.S. Utility Patent No. 1,293,700) describes a knee patch that straps onto overalls for the purpose of extending the life of the garment. Mitchell (U.S. Utility Patent No. 2,568,083) describes pants with knee pads that may be zippered on and off.

Knee pads that are built into, or removeably attached to overalls or pants may well provide a cushioning layer for the knee, but do little to protect the worker and his or her clothing from damp, muddy ground. Denim pants, once wet and muddy, remain wet and muddy, so that the worker must suffer the discomfort throughout the day, whether at lunch or talking to clients or shopping after work,

until the pants are changed. If the pants or coveralls are constructed of a waterproof material, possibly meant to be worn over pants as described in certain inventions, the wearer becomes wet and hot inside the pants, especially in warm weather or when demanding physical labor is required, as perspiration cannot evaporate and cool the body.

Another category of knee pads, meant to be worn over pants and removeable, has evolved. Many of these products share a design flaw – they are held in position by straps or bands that wrap around the back of the knee. They must be well-secured in this position, otherwise the pads “walk out” from under the knee in use. In kneeling, as the knee is bent and weight is placed on the knee joint, blood flow is restricted by the bands behind the knee, and the pads quickly become uncomfortable. And due to the necessary tightness, the knee area does not breathe, and sweat does not evaporate and cool the area.

Worden (U.S. Utility Patent No. 6,427,239) describes an innovative solution to some of the problems described above. His knee pads attach at the ankle instead of behind the knee to address the behind-the-knee “binding” concern. His pads may be put on and removed quickly, and are not attached to pants which can become wet and soiled. However, his “Weight Distributing Knee Pad” does little to protect knees and clothing from dampness or abrasion, and the requisite strapping in the ankle region hinders evaporative cooling of perspiration, if not restricting blood circulation.

None of the prior art discloses a solution to the combined requirements of protection of knee and clothing from hard, abrasive and/or wet surfaces in a form that does not further cause problems of restricted blood circulation (“binding”) and/or discomfort from heat and moisture from sweat and lack of air circulation and evaporative cooling.

#### SUMMARY OF THE INVENTION

It is an object of this invention to provide a knee pad which protects the wearer’s knees from discomfort due to contact with hard objects/surfaces and dampness or mud, and protects the wearer’s clothing from wear, dampness and stains.

It is a further object of this invention to provide a knee pad which does not bind behind the knee.

It is a further object of this invention to provide a knee pad which permits ready circulation of air around the knee and leg area, to allow evaporative cooling of the wearer.

It is a further object of this invention to provide a knee pad that may be quickly and easily donned and removed over normal work clothing.

It is a further object of this invention to provide a knee pad that is affordable to the workers who could most benefit from the innovative design.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of an example, with reference to the accompanying drawings, in which:

FIG.1 is a front view the non-binding knee pad according to one embodiment of the present invention, shown on a standing wearer.

FIG. 2 is a rear perspective showing the open nature of the knee pad.

FIG. 3 is a front view showing the wearer easily and quickly attaching the adjustable straps which hold the pads loosely in position.

FIG. 4 is a perspective view of one embodiment in use with a close-up, cut-away view showing location of the foam knee pad.

#### DETAILED DESCRIPTION OF THE DRAWINGS

A garment may be quickly and easily donned over pants which will protect knees from discomfort while kneeling due to hardness or texture of the kneeling surface, protect pants and knees from dampness and dirt, protect pants from damage, and which will remain cool and comfortable without binding. This garment includes a body composed of a flexible material such as an abrasion resistant fabric, a way to suspend that body from the wearer's waist, a way to connect resilient pads in the knee area, and a way of holding the body and pads loosely to the leg, such as adjustable straps. The weight of the present invention's body, pads and body and connecting method is borne at the user's waist. The foam pads in the knee area hang loosely from the waist rather than being cinched tightly behind the knee, ankle or other part of leg or foot.

FIG.1 is a front view of the non-binding knee pad according to one embodiment of the present invention, shown on a standing wearer. Note that the knee pads

begin approximately at the top of the standing wearer's knee, and extend down in front of the shin. Thus, when the wearer kneels, a primary portion of the foam will come to rest underneath the knee and shin which bears the weight of the wearer's body and equipment.

FIG.2 shows a preferred embodiment from a rear perspective view. The Waist Belt 3 and the Waist Buckle 8 are attached permanently to, and suspend the Pad Body 6, which covers the front of a wearer's leg beginning at approximately the waist and continuing down the leg to below the knee or, in this preferred embodiment, to the top of the ankle. The back of the leg remains uncovered except for the presence of Leg Belts 2 (see below), which may be loosely fitted bands, belts, webs, straps or other mechanism to hold the garment in position. In the preferred embodiment, the Waist Belt 3 and Leg Belts 2 are composed of woven nylon, polypropylene or similar lightweight, robust and relatively inexpensive webbing, and have been outfitted with what is known in the art as an adjustable side release buckle (Waist Buckle 8) to permit comfortable and convenient adjustment to the wearer's proportions, and fast, convenient attachment and disengagement of the belts.

In Fig. 2 the Pocket 5, used for holding incidentals, and the Hanging Loop 4, used as a convenient means of hanging the product when not in use, are both shown as features of this preferred embodiment only, and are not meant to designate necessities for the function of this invention.

In Fig. 2 the Knee Pad Covers 1 hold the Knee Pads (Fig. 4, 1), both of which are located and oriented such that they will be positioned under the knee when the wearer kneels, and will fall between the knee and ankle when the wearer stands. In this preferred embodiment, the knee pads are removeably or permanently enclosed in a flexible pocket (the Knee Pad Covers) of the same fabric as the Pad Body, selected for its light weight and resistance to abrasion – a heavy denier textured nylon fabric similar to or sold under the trade name DuPont Cordura® which may or may not be coated with a water repellent or waterproof coating.

Although reference is made to textured nylon as a preferred embodiment, It should be understood that the present invention foresees the use of a variety of fabrics and flexible materials which could be as effectively used in construction of the Pad Body, Knee Pad Covers and Pockets.

The Knee Pads (Fig.4, 1) may be permanently or removeably attached to the Pad Body. In our preferred embodiment, a soft, resilient, closed cell foam with wall thickness of 0.75 inch to 1.00 inch and composed of a thermoset elastomeric rubber of approximate hardness Shore A 40 was chosen after testing a variety of materials and thicknesses for knee comfort on gravelly surfaces and hard floors. In this preferred embodiment, we selected an approximately half-round tube shape to help hold the knee close to the protective foam as the user moves and works, especially in side-to-side movement, which can otherwise cause the pad to "walk out" from under the knee. Further, a half-round tube shape helps reduce the frontal profile of the pad compared to a flat shape, which might cause the pads to bump together when the user walks. Further, an extruded half-round tube shape is also a relatively inexpensive shape to manufacture compared to molding and other thermoforming options, and therefore supports one of the stated objects of the invention - to provide a knee pad that is affordable to the workers who could most benefit from it's innovative design.

In the preferred embodiment, the resilient foam half-round tube's inside diameter was selected to conform approximately to the outside dimensions of a large adult's knee. Overall length is quite long compared to other knee pads - approximately 8-10 inches - to provide adequate protection as the wearer moves on his or her knees. In our preferred embodiment, the closed cell foam also provides some protection against dampness due to the waterproof nature of the material, the closed cell construction of the foam, and the generous proportions of the cut extrusion.

It will be understood by one skilled in the art that a variety of resilient materials (thermoplastic or thermoset foams, open or closed cell foams, resilient fibers or solids, gels, air or other fluid cells, etc.), thicknesses, cross section dimensions and lengths could be used that would also offer protection of the knee, and would still fall within the description of the Knee Pads in this invention.

In Fig. 2, Crotch Reinforcement 10 helps prevent tearing of the Pad Body in this stress area. Arrow 7 designates the backside of the Pad Body, which will be in contact with the wearer's pants or legs. This surface may be coated with a waterproofing such as solution coat or heat-laminated polyether (water-resistant type) polyurethane or a variety of other coatings, which also serve to help prevent edge unraveling of the textured nylon in the preferred embodiment. The four Leg Belts 2 hold the Pad Body in reasonably close proximity to the leg and knee, and keep the Pad Body from flapping around as the wearer works. When properly

adjusted, the Leg Belts will not restrict blood or air circulation, and remain comfortable even when kneeling for long periods of time.

Fig. 3 depicts a wearer putting on and adjusting the preferred embodiment over his pants. One object of this invention is to provide a knee pad that may be quickly and easily donned and removed over normal work clothing. The present invention in its preferred embodiment, due to the open back design, allows a wearer familiar with the product to don the pads in less than 20 seconds and remove them in less than about 5 seconds over work clothing. The relative ease with which the product can be put on and removed is of significance for those who have need of this kind of protection daily.

The operation and advantages of the present invention will now be readily understood in light of the above description. It is evident that the Non-Binding Knee Pads are particularly useful for workers who spend a great deal of their day on and off their knees, such as gardeners and landscape workers, electricians, telephone and other wiring installers, plumbers, painters, construction workers, concrete and rockery workers, mechanics, etc. Many of these who have worked without benefit of knee protection their whole lives complete their careers with knees that are essentially useless, having have lost almost all flexibility and strength. The retiree must then either have knee replacement surgery or live out his or her life suffering limited mobility, unable to participate in many normal activities. Knee pads that provide adequate and comfortable protection without restricting circulation discourage hyperflexure of the knee, allow jobs in the kneeling position to be done at a more comfortable and thorough pace. The presence of water resistant fabric and/or foam helps keep the knees and clothing warm and dry, and promotes long wear and comfort.

It will be apparent by one skilled in the art that various changes may be made in the form and construction without departing from the spirit of the invention. It is not desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.